DOCUMENT RESUME

ED 066 258 RC 006 376

AUTHOR Sofranko, Andrew J.; And Others
TITLE Some Alternative Measures of National Development and Complexity: An Evaluation and Recommendation.
PUB DATE 22 Aug 72
NOTE 24p.; Paper presented at the Third World Congress of Rural Sociology, Baton Rouge, Louisiana, August 22, 1972

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS Developed Nations; *Developing Nations; Economic Factors; *Educational Improvement; Energy; Political Influences; *Resources; Rural Areas; Social Welfare; *Sociology; Tables (Data); *Telecommunication

ABSTRACT

The purpose of this paper is to assess the predictive utility of several measures of the overall state of societal systems, as well as to determine the degree of overlap of the different measures. Data for 74 nations representing all geographic areas of the world are presented and analyzed. The 5 measures of societal systems chosen for comparison are the power-tool measure, energy consumption, human resource development index, index of societal differentiation, and gross national product per capita. The 5 societal sectors considered in constructing differentiation indices are political, economic, education, social welfare, and communication. The authors conclude that all the measures are not apparently measuring different aspects of society, but the measures appear to tap some similar underlying dimension of society. They suggest the use of an energy consumption measure as the best measure of societal modernization and of the status of societies relative to other societies. (PS)

ED 066258

13

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY

SOME ALTERNATIVE MEASURES OF NATIONAL DEVELOPMENT AND COMPLEXITY: AN EVALUATION AND RECOMMENDATION

Andrew J. Sofranko
Departments of Agricultural Economics and Sociology
University of Illinois-Urbana
Urbana, Illinois

Michael F. Nolan
Department of Rural Sociology
University of Missouri-Columbia
Columbia, Missouri

Robert C. Bealer
Department of Agricultural Economics and Rural Sociology
Pennsylvania State University
University Park, Pennsylvania

Paper Presented at the Third World Congress of Rural Sociology
Baton Rouge, Louisiana
August 22, 1972

RC006376

Some Alternative Measures of
National Development and Complexity:
An Evaluation and Recommendation

The Problem

Modernity is a concept that has been used to describe social systems as well as individuals, and to refer to both a state of a social system and to a process. Industrialization, urbanization, high literacy rates, diversified mass media, widespread and specialized education, mass political participation, extensive social and geographic mobility, and a host of other characteristics are said to mark modernity in national social systems.[1] While scholars readily acknowledge the general features of modern society, there seems to be little agreement on either a unified concept of modernization or, subsequently, on operational indicies for gauging and comparing overall levels of modernity in nations. It is also the case that increasingly the various dichotomies or other typological designations used in the past to study modernization are seen as inadequate. What is needed is an indicator sensitive to minor differences among nations and capable of treating modernization as a continuously distributed variable, yet one which "permits the social scientist and the policy maker to look at the total social system and its institutions ...."[2]

Current uses of the term modernization leave a great deal to be desired. Many studies avoid the issues of what constitutes societal modernity or how it should be measured; they leave the concept undefined. In others, definitions defy operationalization and as a result negate any possibility of assessing relative levels of modernity among nations.[3] Still more suffer from imprecise usage and/or are confused conceptually with development, industriali-

zation, democratization, social mobilization or other terms. All of this brings into question the utility of the concept for research purposes,[4] and gives rise to a pessimistic stance regarding the development of an objective scientifically valid indicator of modernity.[5]

In this paper we attempt to assess the predictive utility of several widely used measures of the overall state of societal systems, as well as determine the degree of overlap of the different measures. We will do this by correlating each measure with all others and then with levels of differentiation in various societal sectors. Hopefully the research should give some indication of the utility of the modernity concept in general and help specify which of the several tested conceptualizations prove to have the greatest empirical validity. At a minimum it should yield a decision on whether indicators of modernity, economic development, societal complexity, etc., are measuring the same phenomenon, or substantially different aspects of the society.

Procedures

Our initial task centers on presenting a set of five different measures that have been developed and widely used to describe the global condition of societal systems and then elaborating on our choice of dependent variables, differentiation in other societal sectors, against which we will evaluate the measures. Our assumption is that the most useful measure of the overall state of a society is the one which can account for most of the variance in our dependent variables and yet still be theoretically meaningful.

Data in the study were collected for 74 nations (See Table 1) for which we could obtain complete data on the dependent variables. The 74 nations

represent all geographic areas of the world and presumably all stages of national development.[6]

Measures of Societal Systems

Five measures of societal systems were chosen for comparison in our study. The list certainly is not exhaustive of the total population of such measures. We hope, however, that our selections are representive of various alternative kinds.

The Power-tool Measure

The power-tool continuum is an attempt by Marion J. Levy to "define modernization ... on the smallest number of factors yielding fruitful results,"[7] while yet setting down a comprehensive conceptual schema for understanding societal complexity. Levy considers a society to be "more or less modernized to the extent that its members use inanimate sources of power and/or tools to multiply the effects of their efforts."[8]

We have developed a measure of the power-tool index of modernization based on four types of inanimate power and two predominant types of tools for which data were available for a variety of nations, Table 1. Items making up the "power-tool index" were:

(1) Gas consumption (per capita; quantities in thousand million cubic meters manufactured gas equivalent.)

(2) Electricity consumption (quantities in kilowatt hours per capita)

(3) All oil fuels (quantities in million metric tons of coal equivalent and kilograms per capita; includes gasoline, kerosene, fuel oils.)

(4) All solid fuels (same units as oil fuels; includes coal and coke.)

(5) Railway traffic (net-ton kilometers per capita, in millions.)

(6) Motor vehicles in use (per capita.)

Energy Consumption

Our measure of energy consumption is provided by the United Nations. It is a per capita summary measure composed of consumption of solid fuels, liquid fuels, natural and converted gas and hydro, nuclear and imported electricity, Table 2. There is sufficient theoretical basis for a conceptualization of modernization in terms of energy use. That such use is an important feature of the modern society, and has implications for cultural development and patterns of social organization, is evidenced in the works of White, Ginsburg, Hall, McClelland, Johnston and Nielsen, and Weller and Sly.[9]

Human Resource Development Index

Developed by Harbison and Meyers,[10] this index is the "arithmetic total of (1) enrollment at second level of education as a percentage of the age group 15 to 19, adjusted for length of schooling and (2) enrollment at the third level of education as a percentage of the age group, multiplied by a weight of 5."

Index of Societal Differentiation

Developed by Robert Marsh, the "index of societal differentiation" consists of an index score based on "percentage of males who are in nonagricultural occupations" and on "gross energy consumption in megawatt-hours per capita for one year."[11]

Gross National Product per Capita

Probably the most widely used (or, depending on your perspective, abused) indicator of societal development is GNP per capita. The argument for the use of it is perhaps most successfully stated by Lerner, who maintains that if a society is to develop it must achieve "rising output per head, and if a society is to modernize it must bring development to the point of self sustaining growth."[12]

The above five measures were used to tap the overall state of societal systems. The "power-tool index" and "energy consumption", which are similar to each other, measure total national consumption of various types of inanimate energy. The "human resource development index" of Harbison and Meyers refers to the "process of increasing the knowledge, skills, and the capacities of all the people in a society," and apparently would index the extent to which these processes have developed. Marsh's "index of societal differentiation" refers to the overall state of internal system differentiation. His task is, "To discover to what extent socio-cultural phenomena vary with this one theoretically strategic variable." "GNP per capita" is a frequently used measure of financial well-being, economic elaboration and, more generally, societal development. The data for all of the measures are presented in Table 2.

In the analysis to follow we will examine the relative predictive value of these various measures and indexes for several dependent variables.

The Dependent Variables

Among modernization theorists there is disagreement on the particulars

of the process by which a relatively nonmodernized society is transformed into a relatively modernized one. However, there appears to be agreement among many about the state of the latter: high structural differentiation.[13] The dependent variables selected for this study can be broadly characterized as measures of differentiation in diverse sectors of society.

We chose five societal sectors in constructing differentiation indices. The sectors and their measures are:

(1) Political: The political differentiation index consists of the following items: freedom of press; freedom of group opposition; interest articulation by associational groups; and character of the bureaucracy.[14]

(2) Economic: Economic differentiation is made up of the following indicators: percent of the population economically active; percent of gross national product originating in industry; and economic development status.[15]

(3) Education: Items used to construct a composite educational differentiation index were: percent of population 5-14 enrolled at first level of education; percent of population 15-19 enrolled at second level of education; percent females at third level of education; number of students (per 100,000 population) enrolled at third level of education, and literacy, percent of population 15 years of age and over literate.[16]

(4) Social Welfare: Index consists of: inhabitants per hospital bed; inhabitants per physician; and percent of deaths which occur under fifty years of age.[17]

(5) Communication: Index consists of: number of telephones (per 10,000 population); radio receivers (per 1,000 population); television receivers (per 10,000 population); newspaper circulation (per 1,000 population); cinema attendance; and newsprint consumption.[18]

All of the above items were taken to be indicators of entry into, participation in, and use of more differentiated structures and roles, a trend said to characterize modernization in various societal sectors. Moreover, while these five institutional sectors are by no means the totality of society, they represent primary spheres of concern, particularly from an action view point. It is within the context of these that the majority of development plans are carried out, and at one time or another each has been suggested as the "critical" sector from which changes are diffused to other institutions and which leads to general societal growth.

The general procedure for arriving at composite indexes for each of the above sectors involved converting the indicators to t-scores and summing, with the sum representing the level of modernization for that particular sector.[19]

Results

Tables 3 and 4 show the intercorrelations occurring within our two sets of variables. It can be seen from Table 3 that all five alternative measures of societal systems correlated quite highly with each other. The coefficients range from .80 to .94. Thus, it may be said that none of the alternatives are, in an empirical sense, highly distinct from one another.

The dependent variables, while less strong than the independent variables, also show a high degree of interrelationship, Table 4. Only the relationship between political and economic differentiation shows up as being rather weak.

Past modernization research studies have shown high intercorrelations between socio-economic measures and other institutional sectors. The present data simply lend additional empirical support to the suggestions that modernization is a broad systematic process encompassing all areas of social life and that modernization is a set of related changes in various institutional sectors.

To more critically evaluate the utility of the five societal system measures, we extended our analysis by correlating the alternative measures (power-tool index; energy consumption; Harbison and Meyers' Human Resource Development Index; Marsh's Societal Differentiation Index; and GNP per capita) with the political, economic, educational, social welfare and communications variables, Table 5. Upon inspection of these results the immediate impression is that, while there are differences (within columns) in the magnitude of the correlations, none of the differences are extreme. Interestingly, all of the measures correlate most poorly with our measure of economic differentiation. This is true even for the one purely economic measure, GNP per capita. It may be that the level of differentiation in the economic sector does not closely parallel differentiation in the other societal sectors. This is also indicated by the fact that economic differentiation had the lowest intercorrelation with the other differention indexes.[20]

To get a rough overall indication of the relative explanatory power

of the various societal measures, we assigned a rank to each of the correlations between the modernization measures and the dependent variables, Table 6. According to the sum of the ranks across the five dependent variables, the power-tool index emerged as the "weakest" overall indicator of the five, and GNP per capita comes out as the strongest. The latter is somewhat surprising considering the amount of criticism that has been leveled against the use of purely economic measures such as GNP per capita. It should be stressed though that in many cases the differences between ranks is very small.[21]

Summary and Evaluation

The data we have presented show a consistent and generally quite strong correlation between our measures of societal systems and the various facets of subsocietal differentiation. The overall significance the data conveys is that all the measures, regardless of what they are labeled, are not apparently measuring <u>different</u> aspects of society. Rather, they all appear to tap some similar underlying dimension of society. One may call it modernization, societal development, human resource development, or what you will.

Considering breadth of time periods for which materials are available, relative accuracy, accessibility, simplicity, and number of nations with reported data, we would argue strongly for the use of an "energy consumption" measure, and more specifically for that published by the United Nations, as the best measure of societal modernization and of the status of societies relative to other societies. According to our data, at least, little predictability is sacrificed by using it rather than any of the alternative measures.

And, it has the advantages indicated at the outset of the paragraph.

In any event, it seems to us that much of the well intentioned debate over the usefulness of the alternative measures can be put aside for the most part. In spite of the differing terminologies employed, all the measures seem to be reaching the same underlying phenomenon to the extent that they all yield similar results when used in a predictive manner. The choice of which to use beyond this criteria rests largely with the researchers' own personal evaluation regarding the relative explanatory usefulness of the competing measures. About that matter our research can say little.

FOOTNOTES

1. Karl W. Deutsch, "Social mobilization and political development," American Political Science Review, 55 (September 1961), pp. 493-514; and Cyril E. Black, The Dynamics of Modernization, New York: Harper and Row, 1966; Daniel Lerner, "The Transfer of Institutions," in William B. Hamilton (ed.), The Transfer of Institutions, Durham, North Carolina: Duke University Press, 1964, pp. 3-26; Phillips Cutright, "National Political Development: Measurement and Analysis," American Sociological Review, 28 (April 1963), pp. 253-64; Individual modernity emphasizes different ways of thinking and belonging, beliefs, psychic reorientations, and values of perceptions, see David Horton Smith and Alex Inkeles, "The OM Scale: A comparative Socio-Psychological Measure of Individual Modernity." Sociometry, 4 (December 1966), pp. 353-77; Alex Inkeles, "Modernization of Man," in Myron Weiner (ed.), Modernization, New York: Basic Books, 1966, pp. 138-50; David C. McClelland and David G. Winter, Motivating Economic Achievement, New York: Free Press, 1969; Joseph Kahl, The Measurement of Modernism, Austin: University of Texas Press, 1968; Alan Peshkin and Ronald Cohen, "The Values of Modernization," Journal of Developing Areas, 2 (October 1967), pp. 7-22.

2. Warren F. Ilchman, "Balanced Thought and Economic Growth," Economic Development and Cultural Change, 14 (July 1966), pp. 385-99.

3. As illustrations we might point to Chapman who states, "Modernization refers to attempts to acquire the features which characterize the industrially advanced, such as high levels of education, medical services, and a modern civil service," (Brian Chapman, The Science of Society, London: George Allen and Unwin Ltd., 1967, p. 27); Blanksten, Modernization is "the change process by means of which a traditional non-western system acquires characteristics usually associated with more developed or less traditional societies." (George I. Blanksten, "Modernization and Revolution in Latin America," in Herbert R. Barringer, George R. Blanksten and Raymond W. Mack (eds.), Social Change in Developing Areas, Cambridge, Mass: Schenkman, 1965, p. 225), Black, Modernization is the process "by which historically evolved institutions are adapted to rapidly changing functions that reflect the unprecedented increase in man's knowledge ..." (Black, op. cit., p. 7); Halpern, modernization involves "attaining a sustained capacity to generate and absorb continuing transformation." (Manfred Halpern, "The Rate and Costs of Political Development," in Wilbert E. Moore and Robert M. Cook, Readings on Social Change, Englewood Cliffs: Prentice-Hall, Inc., 1967, pp. 182-89). Or, modernization is the process of goal-setting and goal attainment in the international context. (J. P. Nettl and Roland Robertson, International Systems and the Modernization of Societies, New York: Basic Books, 1968).

4. See Fred W. Riggs, "Political Aspects of Developmental Change," in Art Gallaher, (ed.), Perspectives in Developmental Change, Lexington: University of Kentucky Press, 1968, pp. 130-71.

5. Milton J. Esman and Fred C. Bruhns, "Institution Building in National Development: An Approach to Induced Social Change in Transitional Societies," in Hollis W. Peter (ed.), Comparative Theories of Social Change, Ann Arbor, Michigan: Foundation for Research on Human Behavior, 1966, p. 340.

6. The rationale underlying our choice of nations and dependent variables is presented elsewhere. See, Andrew J. Sofranko and Robert C. Bealer, "Consequences of Unbalanced Societal Modernization for Domestic Instability," Economic Development and Cultural Change, (forthcoming).

7. Marion J. Levy, Jr., "Changing Conceptions of the Modernization of Japan," in Marius B. Jansen (ed.), Changing Japanese Attitudes Toward Modernization, Princeton: Princeton University Press, 1965, pp. 23-24.

8. Marion J. Levy, Jr., Modernization and the Structure of Societies, Princeton, New Jersey: Princeton University Press, 1966. In elaboration of this definition Levy writes: "I conceive the /power/ continuum to be established in terms of the ratio of inanimate to animate sources of power." "Such a ratio of measure conceivably might yield a somewhat different distribution of modernization than one based simply on "the extent ... /of/ use /of/ inanimate sources of power." (p. 12).

9. See Leslie A. White, The Science of Culture, New York: Farrar, Straus and Cudahy, 1949; Norton Ginsburg, Atlas of Economic Development, Chicago: University of Chicago Press, 1961; Hall, op. cit.,; David C. McClelland, "Does Education Accelerate Economic Growth?" Economic Development and Cultural Change, 14 (April 1966), p. 261; Bruce F. Johnston and Soren T. Nielsen, "Agricultural and Structural Transformation in a Developing Economy, Economic Development and Cultural Change, 14 (April 1966); p. 279; Robert H. Weller and Donald F. Sly, "Modernization and Demographic Change: A World View," Rural Sociology, 34 (September 1969), pp. 313-26.

10. Frederick Harbison and Charles A. Myers, Education, Manpower and Economic Growth, New York: McGraw-Hill, 1964.

11. Robert Marsh, Comparative Sociology, New York: Harcourt, Brace and World, 1967.

12. Daniel Lerner, "Comparative Analysis of Processes of Modernization," in S. Rokkan (ed.), Comparative Research Across Cultures and Nations, The Hague: Mouton, 1968, p. 83.

13. Stated simply, "'differentiation' is the evolution from a multi-functional role structure to several more specialized structures," "the establishment of more specialized and more autonomous social units." (Neil Smelser, in Industrialization and Society, Wilbert E. Moore and Bert F. Hoselitz, (eds.), New York: UNESCO, 1963, pp. 33, 35). (Ibid., p. 33). Whereas in nonmodernized societies there exists a "fusion of institutional functions," modernized society is characterized by a differentiation of institutional structures from the basic family or kinship group and a further differentiation within the various institutional structures. Structurally, differentiation is accompanied by the emergence and proliferation of specialized units or institutions which are organized around distinctive and specific goals or areas of behavior. "In relatively modernized societies without exception one encounters the large-scale possibility of organizations whose members are predominantly concerned with a single aspect of behavior or even a special form of that single aspect." (Levy, Modernization and the Structure of Societies, p. 39). In contrast, "In the context of most of the relatively nonmodernized societies ... most of what in a loose way is characterized as economic behavior in relatively modernized societies would disappear into action in terms of family units." (Ibid, p. 177). Functionally, in modernized society there emerges a separation of roles in terms of the different institutions, especially between roles enacted in the family-kinship context and the non-family; namely, the economic and political spheres. Thus, there are two facets of differentiation: first, kinship group, and, second, elaboration within each of the institutional sub-systems of society.

It should be pointed out that Levy does not particularly favor the term "differentiation" except in his discussion of roles (pp. 187-219). He more frequently talks about "specialization" and subsequent problems of "control".

14. The political data are taken from Arthur S. Banks and Robert B. Textor, A Cross-Polity Survey, Cambridge, Mass.: M.I.T. Press, 1963. The data are all ordinal measures. In this study all of the political items are converted and used as interval scales. Labovitz suggests that this transformation can legitimately be made. He writes that: (1) "treating ordinal data (which may or may not be approximately interval) as interval data by arbitrarily assigning numbers to the ordinal categories can be both legitimate and useful;" (2) "arbitrary assignment, which is consistent with the rank order, rarely alters the results of the statistical analysis to an appreciable degree;" and (3) "small error results from assigning numbers to ordinal data and then treating the categories as if they conform to an interval scale." See Sanford Labovitz, "Some Observations on Measurement and Statistics," Social Forces, 46 (December 1967), pp. 151-60. For a similar argument, see Norman H. Anderson, "Scales and Statistics: Parametric and Non-Parametric," Psychological Bulletin, 58 (1961), pp. 305-16. For information on the manner in which the indicators were coded originally the reader is directed to the Banks and Textor work.

15. Data taken from Compendium of Social Statistics: 1967, New York: United Nations, 1964, pp. 391-95; Harold Fullard and H. C. Darby (eds.), Aldine University Atlas, Chicago: Aldine Press, 1969, pp. 195-208; and Banks and Textor, op. cit., pp. 65-66, respectively.

16. Data for the first four items is taken from Compendium of Social Statistics: 1967, op. cit., pp. 353-58 and pp. 370-73. For the literacy variable, Morris L. Ernst and Judith A. Posner (eds.), the Comparative International Almanac, New York: Random House, 1967, pp. 194-96.

17. Data Taken from Compendium of Social Statistics: 1967, op. cit., pp. 206-13, and pp. 172-77.

18. Data for the first four items were taken from Ernst and Posner, op. cit., the latter two items from Compendium of Social Statistics: 1967, op. cit., pp. 393-408.

19. The transformed data for the variables comprising each of the measures of societal differentiation can be found in, Andrew J. Sofranko and Robert C. Bealer, Unbalanced Modernization and Domestic Instability: A Comparative Analysis, Sage Monograph Series in Comparative Development (Forthcoming). Raw data are contained in Andrew J. Sofranko, "Consequences of Level and Rate of Modernization and Unbalanced Structural Differentiation for Societal Stability," Unpublished Ph.D. Dissertation, Pennsylvania State University, March 1970.

20. It can be charged that one would expect high correlations among some of the societal measures and between them and the measures of societal differentiation because each was constructed from similar variables. For example, the components of Harbison and Myers Human Resource Development Index parallel closely the items in our measure of educational differentiation. As might be expected the correlation between these two variables was high (.86) but interestingly not as high as the correlation between the Harbison-Myers measure and the measure of communications differentiation. A similar result can be observed for the relationship between GNP per capita and economic differentiation. In this instance though, the correlation was actually the lowest reported for GNP per capita. All this seems to imply that in spite of overlap between the independent and dependent variables due to our operational procedures, each is capable of standing alone on a conceptual level. At the same time, the high level of empirical connectedness does not leave much room for making a strong case for any one measure as predictively much better than the next.

21. In an earlier paper we suggested that Levy's power-tool measure may be superior to GNP per capita in terms of explaining differences in levels of societal differentiation (See, Andrew J. Sofranko, Michael F. Nolan and Robert C. Bealer, "The Definition of Modernization as a Power Continuum and Some Concomitant Structural Differentiations: Data in Defense of a Maligned Conceptualization," Probe, 1 (December, 1971):11-30. It should be noted that our earlier conclusion was based on: (1) a sample of 54 nations rather than the 74 used here; and, (2) substantially different and now partial measures of both the power-tool continuum and societal differentiation.

In terms of the nations and measures used in this paper, we would still conclude that the power-tool ratio is indeed a useful and valid indicator of societal modernity. However, it may not be any more useful (in a predictive sense) than other measures currently being employed. As the title of the Probe paper implies, the major concern there was to argue against the critics of Levy's work. While his conceptualizations may be no better than others, at least they are no worse either. The critics were contending otherwise.

Table 1 : Per Capita Consumption of Energy and Use of Selected Tools

Country	Per Capita Consumption: Gas	Electricity	Oil Fuels	Solid Fuels	Railway Traffic	Motor Vehicles in use (per capita)
United States	6.265	6344	2550	2275	5.03	.438
United Kingdom	.565	3699	1240	3225	.48	.183
France	.458	2210	968	1271	1.35	.224
Japan	.121	2210	761	680	.62	.054
Italy	.446	1747	920	226	.29	.103
Switzerland	.058	3909	1349	219	.90	.158
Canada	4.130	7824	2493	1143	6.44	.329
Australia	.284	345	1332	2849	1.54	.321
Turkey	.020	17	129	188	.14	.005
S. Africa	.062	177	267	2263	2.21	.071
U.S.S.R.	1.528	232	731	1830	8.14	.013
Burma	.001	2	30	6	.03	.002
India	.005	75	22	135	.19	.002
Ceylon	.001	45	81	2	.03	.011
Poland	.350	1490	147	3295	2.54	.012
United Arab Rep.	.001	105	197	10	.12	.003
Thailand	.000	57	118	2	.05	.005
Philippines	.001	166	131	3	.01	.007
Germany (Fed)	.556	3087	1220	2299	1.01	.154
Czechoslovakia	.625	2705	323	4980	3.94	.016
New Zealand	.066	4297	924	759	.89	.310
Israel	.085	1734	1462	5	.13	.040
Greece	1.001	662	385	227	.06	.017
Cambodia	.000	14	30	5	.01	.004
Netherlands	.830	2214	1498	977	.32	.106
Mexico	.661	433	393	32	.41	.027
Iran	.135	90	212	11	.09	.007
Tunisia	.009	128	144	18	.25	.017
Austria	.137	2610	757	998	1.15	.136
Ghana	.000	82	53	6	.05	.006
Lebanon	.000	351	416	0	.02	.039
Syria	.000	121	243	0	.02	.002
Argentina	.483	676	704	48	.59	.057
Brazil	.027	392	195	40	.21	.022
Peru	.208	339	313	11	.06	.020
Venezuela	2.067	979	937	19	.00	.059
Ecuador	.000	131	139	0	.02	.008
Chile	.445	761	416	186	.29	.022
Colombia	.141	341	176	161	.05	.013
Ethiopia	.000	11	9	0	.01	.001
Rumania	2.031	1047	318	456	1.55*	.002
Hungary	.437	1321	333	2067	1.60	.008
Norway	.051	12809	1350	341	.51	.148
Sweden	.067	6344	2651	390	1.69	.233
Afghanistan	.000	22	9	9	.25*	.001

Table 1 (continued)

Country	Per Capita Consumption: Gas	Electricity	Oil Fuels	Solid Fuels	Railway Traffic	Motor Vehicles in use (per capita)
Albania	.000	216	145	92	1.55*	.001
Bolivia	.058	155	118	0	.15*	.011
Bulgaria	.020	1427	477	1966	1.22	.002
Costa Rica	.000	469	176	0	.02	.022
Cuba	.009	473	646	12	.10	.017
Cyprus	.000	661	665	0	1.55*	.065
Denmark	.102	2067	2282	1073	.32	.192
Dominican Rep.	.000	164	132	0	3.23*	.011
El Salvador	.000	157	109	0	3.23*	.009
Finland	.015	3432	1535	577	1.06	.102
E. Germany	.219	3329	261	5081	3.10	.051
Guatemala	.000	119	139	0	10.58	.010
Haiti	.000	16	21	0	3.23*	.002
Honduras	.000	86	110	0	3.23*	.007
Iceland	.000	3459	2448	30	3.23*	.169
Ireland	.070	1348	0772	1254	.12	.108
Jordan	.000	85	200	0	.25*	.008
Laos	.000	9	32	0	.25*	.003
Liberia	.000	311	191	0	.37	.001
Libya	.000	108	264	4	.01	.034
Morocco	.002	104	86	33	.16	.017
Nicaragua	.000	195	166	320	.01	.011
Panama	.017	368	760	0	3.23*	.031
Paraguay	.000	97	77	0	.01	.005
Saudi Arabia	.012	99	215	0	.01	.012
Sudan	.000	18	51	0	.18	.003
Uruguay	.011	703	506	18	.15	.072
Belgium	.327	272	140	1460	.74	.147
Luxembourg	.503	282	146	1770	2.04	.201

Sources: Column 1, Calculated from gas consumption data presented in World Energy Supplies: 1963-66, Statistical Papers, Series J, No. 11, New York: United Nations, 1968, pp. 88-92.
Column 2, Ibid., pp. 93-102.
Column 3, Ibid., pp. 54-73.
Column 4, Ibid.
Column 5, United Nations Statistical Yearbook, New York: United Nations, 1969, p. 385.
Column 6, Ibid., p. 389. Also Norton Ginsburg, Atlas of Economic Development, Chicago: University of Chicago Press, 1961.

*Above figure represents an average.

Table 2 : Alternative Measures of Societal Development

Country	Energy Consumption	Index of Societal Differentiation	Index of Human Resource Development	GNP per Capita	Power/ tool Score
USA	8913	109.4	261.30	3020	493.43
UK	5097	84.6	121.60	1500	361.28
France	2934	57.5	107.80	1540	335.42
Japan	1664	41.5	111.40	660	301.12
Italy	1657	41.3	56.80	850	304.33
Switzerland	2475	51.6		2030	325.93
Canada	7040	89.9	101.60	1940	461.84
Australia	4533	72.7	137.70	1730	355.88
Turkey	340	23.9	27.20	240	267.85
S. Africa	2557	45.3	40.00	530	307.79
USSR	3428	41.4	92.90	890	351.93
Burma	50	19.2	14.20	65	263.54
India	161		35.20	90	265.82
Ceylon	98	28.8		130	265.45
Poland	3518	45.8	66.50	930	319.92
United Arab Rep.	321	23.9	40.10	150	267.59
Thailand	106	13.7	35.10	110	265.52
Philippines	201	20.9		140	266.25
Germany (Fed)	4228	68.4	85.80	1540	344.32
Czechoslovakia	5788	65.5	68.90	1200	354.24
New Zealand	2452	58.0	147.30	1760	342.70
Israel	1604	41.3	84.90	1070	298.90
Greece	599	31.0	48.50	510	286.66
Cambodia	43	15.3		120	263.70
Netherlands	3342	58.0	133.70	1260	326.67
Mexico	993	29.3	33.00	430	283.17
Iran	373	17.4	17.30	210	269.07
Tunisia	272	25.7	15.25	180	268.85
Austria	2635	51.3		1020	317.63
Ghana	103		23.15	230	264.81
Lebanon	615		24.30	390	274.92
Syria	381	18.3		130	267.20
Argentina	1257	45.4	82.00	650	291.43
Brazil	363	26.3	20.90	220	271.70
Peru	614	23.0	30.20	270	273.81
Venezuela	2799	39.0	47.70	780	310.41
Ecuador	200	23.5	24.40	190	266.33
Chile	1089	40.6	51.20	450	282.94
Colombia	492	24.8	22.60	270	271.56
Ethiopia	9	17.2	.75	50	262.99
Rumania	1785	21.8		710	306.89
Hungary	2826	36.8	53.90	890	306.57
Norway	3497	55.2	73.80	1520	366.00
Sweden	4372	62.7	79.20	2040	371.03
Afghanistan	22	12.0	1.90	85	264.39

Table 2 (continued)

Country	Energy Consumption	Index of Societal Differentiation	Index of Human Resource Development	GNP per Capita	Power/ Tool Score
Albania	308			380	274.91
Bolivia	207	21.4	14.80	140	267.78
Bulgaria	2405	23.0		650	301.08
Costa Rica	267	24.1	47.30	360	270.01
Cuba	954	40.0	35.50	360	277.20
Cyprus	839	35.2		530	290.98
Denmark	3946	55.7	77.10	1650	340.07
Dominican Rep.	224	23.5	14.50	210	283.57
El Salvador	178	19.5		260	282.96
Finland	2349	47.5	88.70	1440	324.01
East Germany	5583	62.8		1120	352.13
Guatamala	175	17.1	10.70	290	321.94
Haiti	34	11.0	5.30	75	280.21
Honduras	155	13.8		190	282.43
Iceland	3713	52.5		1550	351.48
Ireland	2340			800	305.02
Jordan	262	16.1		220	268.24
Laos	33	9.6		60	264.81
Liberia	231	17.3	4.10	180	269.05
Libya	325	14.8	10.85	210	270.91
Morocco	162	18.8		170	267.42
Nicaragua	255	16.7		320	270.19
Panama	892	26.9		450	296.35
Paraguay	104	22.6	22.70	200	264.87
Saudi Arabia	310	13.5	1.90	190	267.34
Sudan	62	17.4	7.55	95	264.78
Uruguay	827	39.7	69.80	540	282.47
Belgium	4668	74.5	123.60	1460	302.50
Luxembourg	4668	70.8		1770	319.99

Sources: Column 1, World Energy Supplies: 1963-66, Statistical Papers, Series J, No. 11, New York: United Nations, 1968, pp. 14-33.
Column 2, Robert Marsh, Comparative Sociology, New York: Harcourt, Brace and World, 1967, pp. 366-74.
Column 3, Frederick Harbison and Charles A. Myers, Education Manpower and Economic Growth, New York: McGraw-Hill, 1964, p. 33.
Column 4, World Bank Atlas, Washington: International Bank for Reconstruction and Development, 1970.

Table 3 : Correlation Matrix of Alternative Modernization Indexes

	PT	EC	HRD	SD	GNP
Power-Tool Index (PT)	---				
Energy Consumption (EC)	.93(74)	---			
Human Resource Development (HRD)	.81(53)	.83(53)	--		
Societal Differentiation (SD)	.88(69)	.94(69)	.89(50)	--	
Gross National Product (GNP)	.90(74)	.91(74)	.80(53)	.92(69)	--

Table 4 : Correlation Matrix of Dependent Variables, Modernization in Different Societal Sectors

	Economic	Political	Education	Social Welfare	Communi-cation
Economic	--				
Political	.25	--			
Educational	.54	.55	--		
Social Welfare	.52	.60	.79	--	
Communication	.44	.62	.76	.66	--

Table 5 : Relationships of Alternative Indexes of Modernization-Differentiation and Modernization in Other Societal Areas

Modernization Index	Differentiation Index									
	Political		Economic		Education		Social Welfare		Communications	
	r	N	r	N	r	N	r	N	r	N
Power-Tool	.47	74	.51	74	.69	74	.57	74	.87	74
Energy Consumption	.43	74	.54	74	.74	74	.62	74	.87	74
Human Resource Development	.63	53	.47	53	.86	53	.62	53	.88	53
Societal Differentiation	.62	69	.51	69	.79	69	.68	69	.92	69
Gross National Product	.61	74	.50	74	.76	74	.67	74	.93	74

Table 6 : Rank of Size of Correlations Between Different Indexes of Modernization and Alternative Indexes of Modernization

Modernization Index	Rank					
	Political	Economic	Educational	Social Welfare	Communi-cation	Sum of Ranks
Power Tool	4	2.5	5	5	4.5	21.0
Energy Consumption	5	1	4	3.5	4.5	18.0
Human Resource Development	1	5	1	3.5	3	13.5
Societal Differ-entiation	2	2.5	3	2	1	10.5
Gross National Product	3	4	2	1	2	12.0